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Document Listing

Document	Image pages	Text pages	Error pages
US 5666293 A	0	6	0
Total	0	6	0

US-PAT-NO: 5666293
DOCUMENT-IDENTIFIER: US 5666293 A
TITLE: Downloading operating system software through
a broadcast channel
DATE-ISSUED: September 9, 1997
US-CL-CURRENT: 709/220,348/10 ,348/12 ,348/7 ,455/3.1
,455/4.1 ,455/4.2
,455/5.1
APPL-NO: 8/ 498265
DATE FILED: July 3, 1995
PARENT-CASE:
CROSS REFERENCE TO RELATED APPLICATION This application
is a
Continuation-In-Part of U.S. patent application Ser.
No. 08/380,755 filed
Jan. 31, 1995 which is a Continuation-In-Part of U.S.
patent application Ser.
No. 08/250,791 filed May 27, 1994, the disclosures of
both of which are
incorporated herein entirely by reference.

TTL:
Downloading operating system software through a
broadcast channel

BSPR:
An operating system includes programming to control
internal operations of the
control processor, such as those necessary to execute
specific types of
communications over the network, graphics drivers, etc.
The operating system
typically allows the set-top to run a variety of
downloaded applications
programs, preferably made available by a number of
service providers. It is
desirable to periodically update the operating system
software, as improvements
are developed, without having a technician manually
service each terminal. The
downloading of an operating system program for running
the terminal device

raises a more complicated set of problems relating to who can download such
software to which types of terminals.

BSPR:
Access to the ability to modify the operating system must be carefully
controlled. If access were open, an unscrupulous party could write a
destructive operating system, e.g. that would allow the terminal to access only
one provider's services or that might cause the terminal to begin upstream
transmissions in some manner which would disrupt upstream transmissions of
other terminals. The downloaded operating system would need to correspond to
the particular type of set-top terminal to insure compatibility. Also, the
downloading of the operating system must be particularly error free to insure
that errant reception and overwriting of operation system software does not in
some corrupt or disable terminal operation.

BSPR:
A need therefore still exists to reliably and securely download operating
system software to the digital set-top terminal through a widely accessible
broadcast channel.

BSPR:
The present invention addresses the above noted needs by providing methods,
systems and terminal device structures for downloading operating system
software to programmable set-top terminal devices through digital broadcast
channels.

DEPR:
With the present invention the set-top terminal 100

(preferably the DET portion
102 thereof) receives and stores downloaded operating
system software and
application software. The terminal 100 can establish a
point to point link to
interactive equipment operated by a video information
provider (VIP) and
receive interactive applications software through the
point to point link, as
disclosed in the above incorporated 08/250,791
application. The key features
of the present invention, however, relate to
downloading an operating system
through a broadcast channel, therefore the following
description concentrates
on a broadcast type network implementation and
downloading of the operating
system through a broadcast channel.

DEPR:
A party providing the operating system upgrade service
operates a data carousel
application. With this type of application, a digital
data stream cyclically
repeats, and in accord with the present invention, the
network carries the
repeating data stream on a broadcast channel. The data
stream may include
video, audio, data and executable code. For an
operating system download, the
repeating data consists of a data file containing new
operating system code.

DEPR:
The DET 102 processes the MPEG II packets in the
resultant stream based on
their respective PID values. Packets having PID values
assigned to audio or
video are processed by corresponding decoders and
associated driver circuits to
produce signals for driving the television set 103 to
display the program

information to the user.   Downloaded software, however,
is transferred as
private data to the microprocessor of the DET. Of
particular note for purposes
of the present invention, if the software relates to an
operating system, the
microprocessor executes the upgrade routine to replace
the existing operating
system stored in non-volatile RAM with the newly
received operating system
software.

DEPR:
The network interface module 101 takes the form of a
plug in module. In one
embodiment, the module 101 would be similar to a
daughter board or option card
which can be plugged into a back plane of a personal
computer (PC). In such an
embodiment, typically a technician could replace the
module in either the field
or the shop, to modify a set-top device 100 to connect
to and communicate over
a different network, and the technician would modify
associated communications
control software in the system memory. Alternative
implementations may use a
user replaceable cartridge type network interface
module, similar to a video
game cartridge, which may include memory in the module
for storage of the
communications control. As a further alternative, the
network interface module
could include a digital signal processor controlled by
the CPU of the DET 102
and input/output connections compatible with all of the
digital broadband
networks currently available. The downloaded operating
 system software stored
in the system memory of the DET would control
operations of the digital signal
processor to send and receive signals in accord with
the particular network to

which the subscriber chooses to connect the set-top
device 100.

DEPR:
The DET 102 includes a CPU 105, comprising a 386, 486
PENTIUM.TM., or Motorola
6800 Series microprocessor 110 and associated system
memory 120. The system
memory 120 includes at least 2 mbytes of volatile
dynamic random access memory
(RAM) 122 and 1 mbyte of non-volatile random access
memory (NVRAM) 121. In the
preferred embodiment, the NVRAM 121 is a flash memory
device. The CPU 105 also
includes a read only memory (ROM) 115, either as a
separate element connected
to the microprocessor 110 as shown or as an element
within the microprocessor
110. The ROM 115 stores "loader" programming needed to
control wake-up. The
non-volatile RAM 121 stores the operating system for
the microprocessor 110.
In operation, the volatile RAM 122 temporarily stores
applications programs for
execution by the microprocessor 110 as well as related
data files, and during
operating system download operations, the RAM 122
temporarily stores the new
operating system.

DEPR:
In the preferred embodiment, the operating system for
the DET 102 includes a
version of a PC type operating system, e.g. OS-9. In
addition, the operating
system for the DET 102 includes the various drivers
necessary for the DET
microprocessor 110 to operate the associated
peripherals, e.g. the Digital
Audio/Video Processor 125, the Personal Computer Memory
Card Industry
Association (PCMCIA) port 155, the RS-232 transceiver

151, etc. The set-top
operating system also includes the resident cable
television emulation
software, i.e. as needed to facilitate reception of
broadcast programs through
the particular network. This operating system is
stored in a portion of the
non-volatile RAM 121 having a relatively low level of
protection. When a new
operating system is installed, as discussed more fully
below, the new operating
system replaces the entire operating system previously
stored in the
non-volatile RAM. The level of protection here
provided enables rewriting the
operating system using a broadcast channel download
procedure, however, there
is sufficient protection to limit storage to only
acceptable software from an
authorized provider.